



## PD85006L-E

RF power transistor  
the LdmoST plastic family

### Features

- Excellent thermal stability
- Common source configuration
- $P_{OUT} = 6\text{ W}$  with 15 dB gain @ 870 MHz / 13.6 V
- Plastic package
- ESD protection
- In compliance with the 2002/95/EC european directive

### Description

The PD85006L-E is a common source N-channel, enhancement-mode lateral Field-Effect RF power transistor. It is designed for high gain, broadband commercial and industrial applications. It operates at 13.6 V in common source mode at frequencies of up to 1 GHz. PD85006L-E boasts the excellent gain, linearity and reliability of ST's latest LDMOS technology mounted in leadless SMD plastic RF power package, PowerFLAT™. PD85006L-E's superior linearity performance makes it an ideal solution for mobile radio applications.

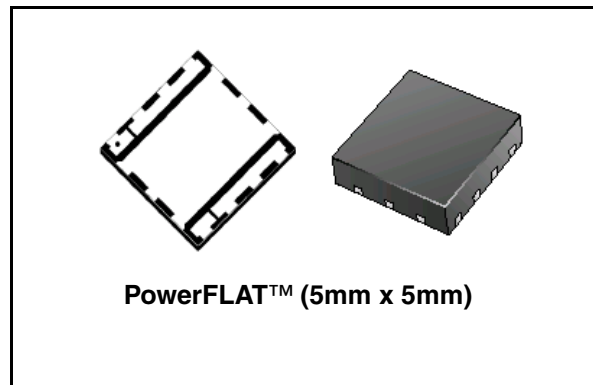


Figure 1. Pin connection

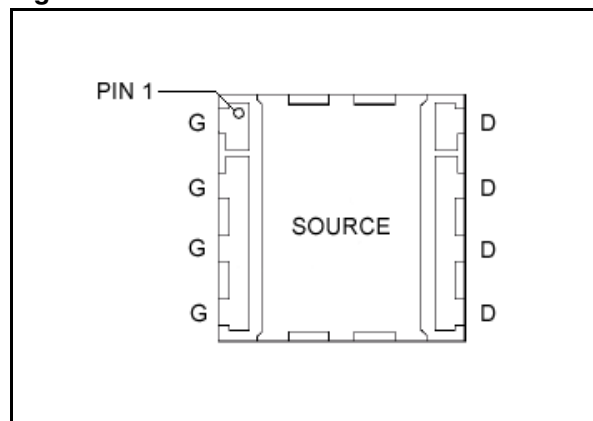


Table 1. Device summary

Order code	Marking	Package	Packaging
PD85006L-E	85006	PowerFLAT™	Tape and reel

# Contents

<b>1</b>	<b>Electrical data</b> .....	<b>3</b>
1.1	Maximum ratings .....	3
1.2	Thermal data .....	3
<b>2</b>	<b>Electrical characteristics</b> .....	<b>4</b>
2.1	Static .....	4
2.2	Dynamic .....	4
2.3	ESD protection characteristics .....	4
2.4	Moisture sensitivity level .....	4
<b>3</b>	<b>Impedances</b> .....	<b>5</b>
<b>4</b>	<b>DC curves</b> .....	<b>6</b>
<b>5</b>	<b>RF curves</b> .....	<b>7</b>
<b>6</b>	<b>Schematic and BOM</b> .....	<b>9</b>
<b>7</b>	<b>Demoboard photo</b> .....	<b>11</b>
<b>8</b>	<b>Package mechanical data</b> .....	<b>12</b>
<b>9</b>	<b>Revision history</b> .....	<b>16</b>

# 1 Electrical data

## 1.1 Maximum ratings

Table 2. Absolute maximum ratings ( $T_{CASE} = 25^{\circ}C$ )

Symbol	Parameter	Value	Unit
$V_{(BR)DSS}$	Drain-source voltage	40	V
$V_{GS}$	Gate-source voltage	-0.5 to +15	V
$I_D$	Drain current	2	A
$P_{DISS}$	Power dissipation	20.8	W
$T_J$	Max. operating junction temperature	150	$^{\circ}C$
$T_{STG}$	Storage temperature	-65 to +150	$^{\circ}C$

## 1.2 Thermal data

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thJC}$	Junction - case thermal resistance	6	$^{\circ}C/W$

## 2 Electrical characteristics

$$T_{CASE} = +25\text{ }^{\circ}\text{C}$$

### 2.1 Static

Table 4. Static

Symbol	Test conditions			Min	Typ	Max	Unit
$I_{DSS}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 25\text{ V}$				1	$\mu\text{A}$
$I_{GSS}$	$V_{GS} = 5\text{ V}$	$V_{DS} = 0\text{ V}$				1	$\mu\text{A}$
$V_{GS(Q)}$	$V_{DS} = 13.6\text{ V}$	$I_D = 200\text{ mA}$		4			V
$V_{DS(ON)}$	$V_{GS} = 10\text{ V}$	$I_D = 0.25\text{ A}$		0.27			V
$C_{ISS}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 13.6\text{ V}$	$f = 1\text{ MHz}$		16		pF
$C_{OSS}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 13.6\text{ V}$	$f = 1\text{ MHz}$		14		pF
$C_{RSS}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 13.6\text{ V}$	$f = 1\text{ MHz}$		1.1		pF

### 2.2 Dynamic

Table 5. Dynamic

Symbol	Test conditions			Min	Typ	Max	Unit
$P_{OUT}$	$V_{DD} = 13.6\text{ V}$ , $I_{DQ} = 200\text{ mA}$ , $P_{IN} = 0.1\text{ W}$ , $f = 870\text{ MHz}$			5	6		W
$G_{PS}$	$V_{DD} = 13.6\text{ V}$ , $I_{DQ} = 200\text{ mA}$ , $P_{OUT} = 5\text{ W}$ , $f = 870\text{ MHz}$			15	17		dB
$N_D$	$V_{DD} = 13.6\text{ V}$ , $I_{DQ} = 200\text{ mA}$ , $P_{OUT} = 5\text{ W}$ , $f = 870\text{ MHz}$			55	63		%
Load mismatch	$V_{DD} = 13.6\text{ V}$ , $I_{DQ} = 200\text{ mA}$ , $P_{OUT} = 5\text{ W}$ , $f = 870\text{ MHz}$ All phase angles			20:1			VSWR

### 2.3 ESD protection characteristics

Table 6. ESD protection characteristics

Test conditions	Class
Human body model	2
Machine model	M3

### 2.4 Moisture sensitivity level

Table 7. Moisture sensitivity level

Test methodology	Rating
J-STD-020B	MSL 3

### 3 Impedances

Figure 2. Impedances

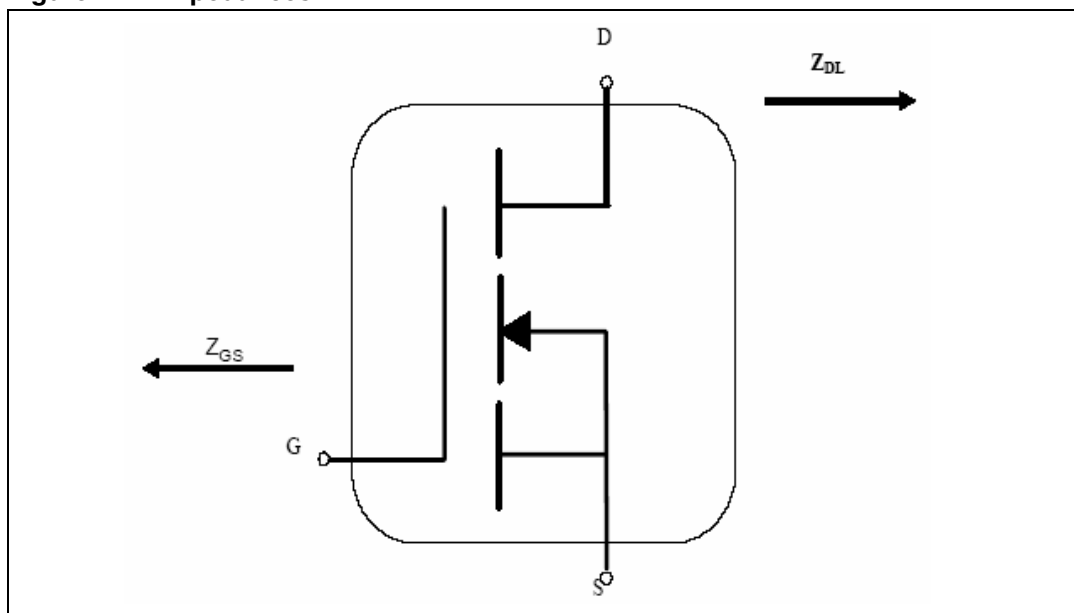


Table 8. Broadband impedances

F(MHz)	$Z_{GS}$	$Z_{DL}$
860	2.66+ j 4.28	6.23+ j 5.71
880	2.81+ j 4.35	6.46+ j 6.20
900	2.88+ j 4.34	6.73 + j 6.66
920	2.87+ j 4.25	7.06+ j 7.06
940	2.68+ j 4.20	7.40+ j 7.45
960	2.39+ j 4.20	7.80+ j 7.75

# 4 DC curves

Figure 3. DC output characteristics

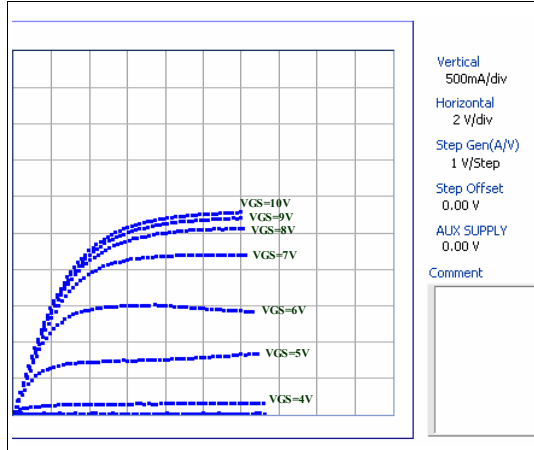


Figure 4. ID vs VGS

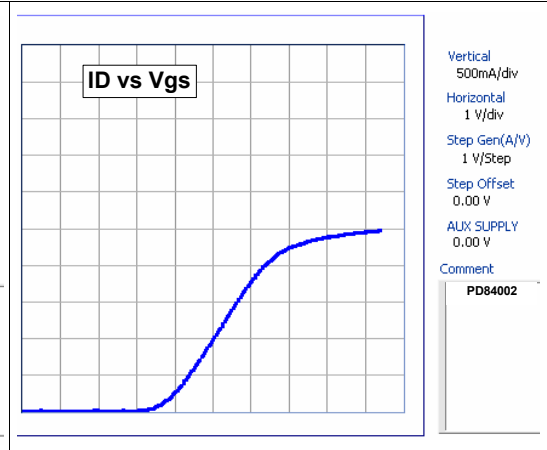
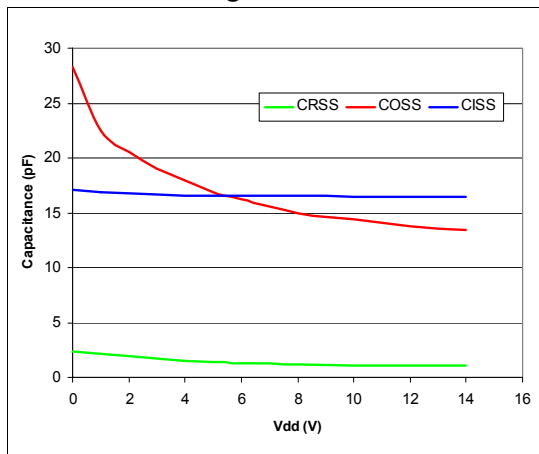
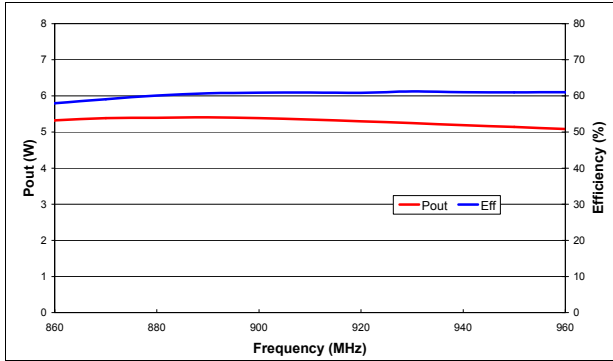


Figure 5. Capacitances vs drain voltage

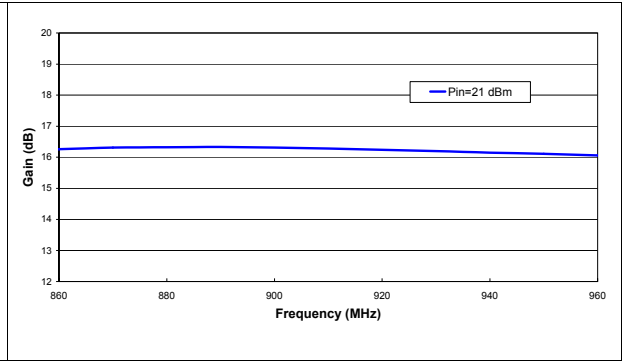


# 5 RF curves

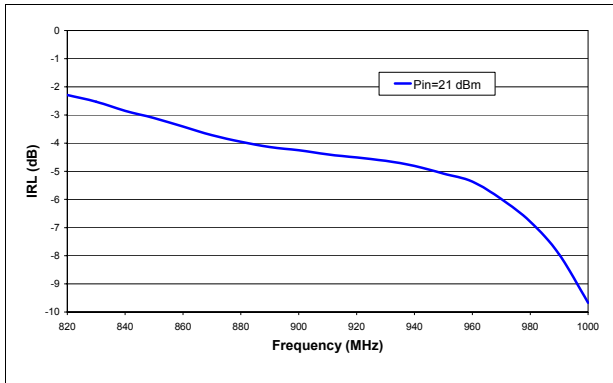
**Figure 6. Output power and efficiency vs frequency**  
 13.6 V / 200 mA / Pin = 21 dBm



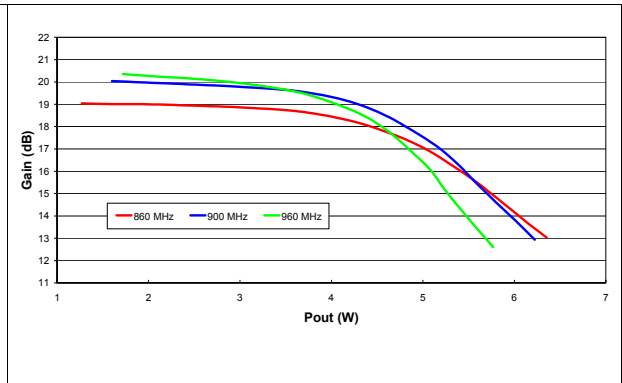
**Figure 7. Gain vs frequency**  
 13.6 V / 200 mA



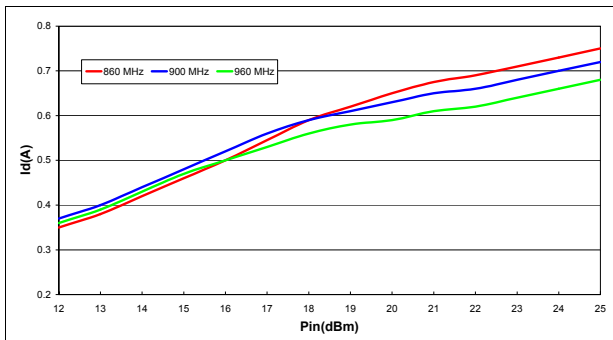
**Figure 8. Input return loss vs frequency**  
 13.6 V / 200 mA



**Figure 9. Gain vs pout**  
 13.6 V / 200 mA



**Figure 10. Id vs Pin**  
 13.6 V / 200 mA



**Figure 11. Pout vs pin**  
 13.6 V / 200 mA

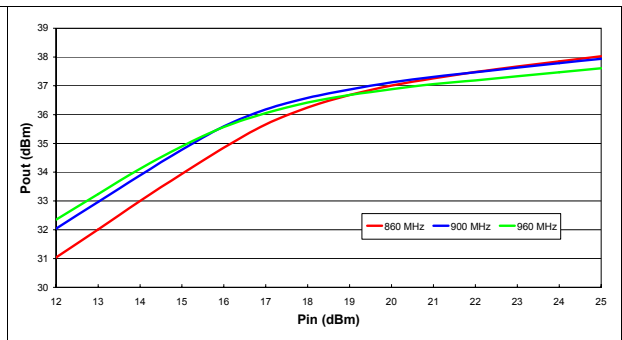
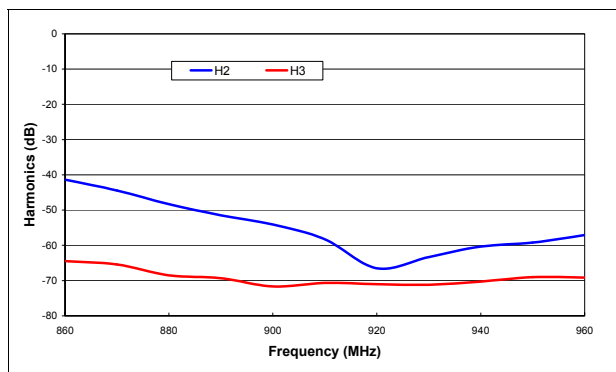


Figure 12. Harmonics vs frequency  
13.6 V / 200 mA





# 6 Schematic and bill of material

Figure 13. Schematic and bill of material

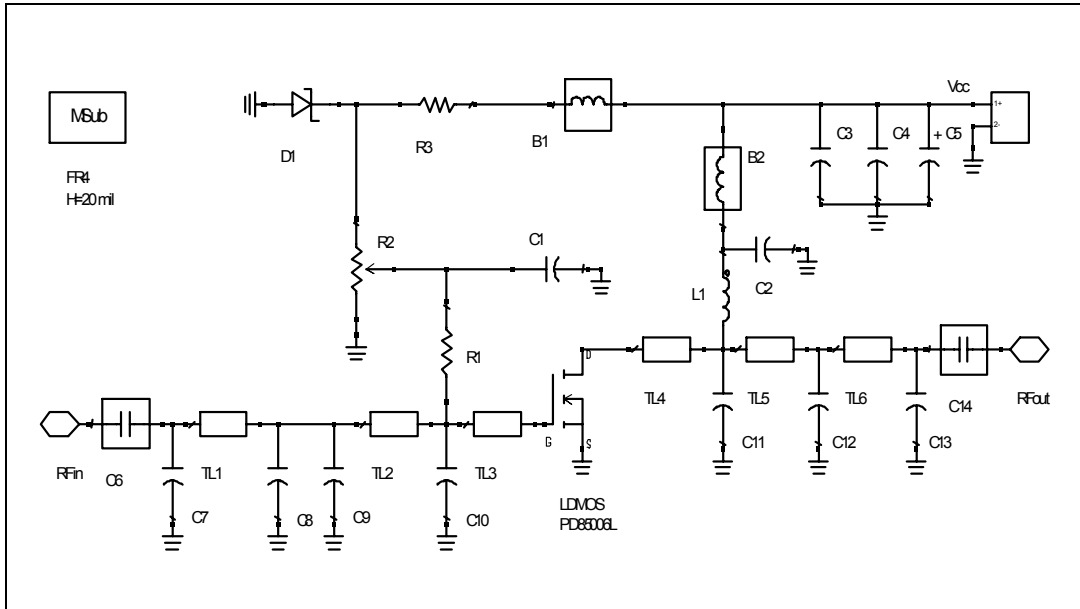
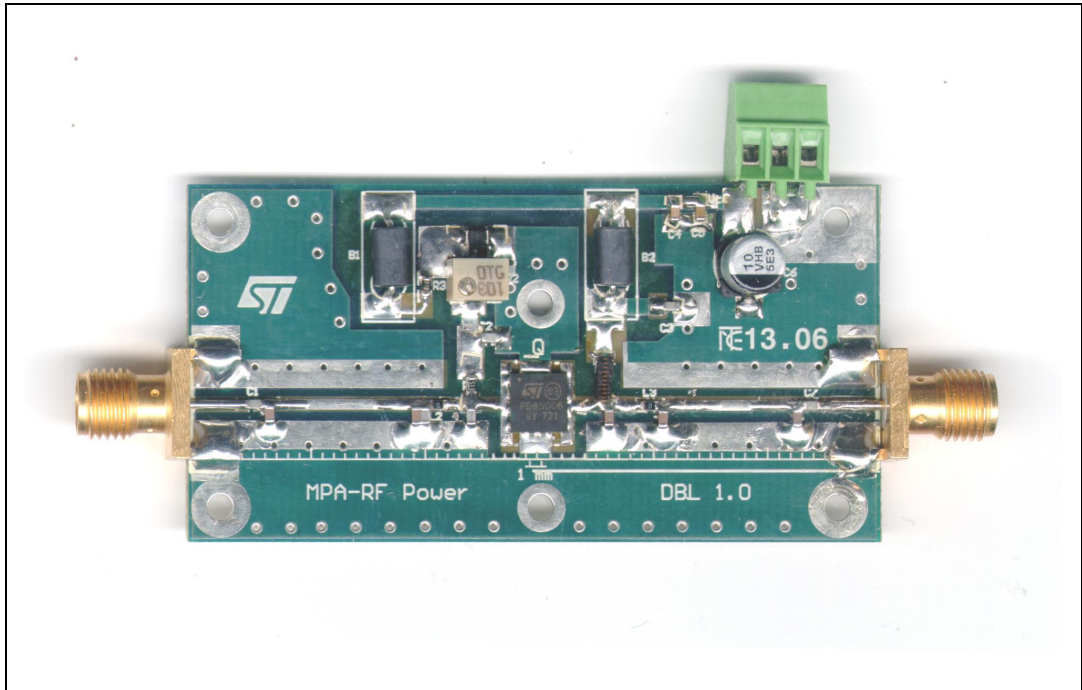


Table 9. Components part list

Component ID	Description	Value	Case size	Manufacturer	Part code
B1	Ferrite Bead			Panasonic	EXCELDRC35C
B2	Ferrite Bead			Panasonic	EXCELDRC35C
C1, C2	Capacitor	120 pF	0603	Murata	GRM39-C0G121J50D500
C3	Capacitor	1 nF	0603	Murata	GRM39-X7R102K50C560
C4	Capacitor	10 nF	0603	Murata	GRM39-X7R103K50C560
C5	Capacitor	10 uF	SMT	Panasonic	EEVHB1V100P
C6, C14	Capacitor	39 pF	0603	Murata	GRM39-C0G390J50D500
C7	Capacitor	3.3 pF	0603	Murata	GRM39-C0G3R3C50Z500
C8	Capacitor	2.7 pF	0603	Murata	GRM39-C0G2R7C50Z500
C9	Capacitor	12 pF	0603	Murata	GRM39-C0G120J50D500
C10	Capacitor	22 pF	0603	Murata	GRM39-C0G220J50D500
C11	Capacitor	8.2 pF	0603	Murata	GRM39-C0G8R2D50Z500
C12	Capacitor	6,8 pF	0603	Murata	GRM39-C0G6R8D50Z500
C13	Capacitor	3.9 pF	0603	Murata	GRM39-C0G3R9C50Z500
D1	Zener Diode	5.1 V	SOD110	Philips	BZX284C5V1
L1	Inductor	12.55 nH		Coilcraft	1606-10
R1	Resistor	510 $\Omega$	0603	Tyco electronics	
R2	Potentiometer	10 K $\Omega$		Bourns electronics	3214W-1-103E
R3	Resistor	1 K	0603	Tyco electronics	01623440-1
TL1	Transmission line	W=0.92mm	L=12.1 mm		
TL2	Transmission line	W=0.92mm	L=3.2 mm		
TL3	Transmission line	W=0.92mm	L=3.0 mm		
TL4	Transmission line	W=0.92mm	L=3.2 mm		
TL5	Transmission line	W=0.92mm	L=3.9 mm		
TL6	Transmission line	W=0.92mm	L=11.0 mm		
RF in, RF out	SMA-CONN	50 $\Omega$	60 mils	JOHNSON	142-0701-801
PD85006L	LD MOS			STMicroelectronics	PD85006L
Board	FR-4 THk=0.020" 2OZ Cu both sides				

# 7 Demoboard photo

Figure 14. Demoboard photo



## 8 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: [www.st.com](http://www.st.com)

Table 10. PowerFLAT™ (5x5) mechanical data

Dim.	mm			inch		
	Min	Typ	Max	Min	Typ	Max
A		0.90	1.00		0.035	0.039
A1		0.02	0.05		0.001	0.002
A3		0.24			0.009	
AA	0.15	0.25	0.35	0.006	0.01	0.014
b	0.43	0.51	0.58	0.017	0.020	0.023
c	0.64	0.71	0.79	0.025	0.028	0.031
D		5.00			0.197	
d		0.30			0.011	
E		5.00			0.197	
E2	2.49	2.57	2.64	0.098	0.101	0.104
e		1.27			0.050	
f		3.37			0.132	
g		0.74			0.03	
h		0.21			0.008	

Figure 15. PowerFLAT™ (5x5) package dimensions

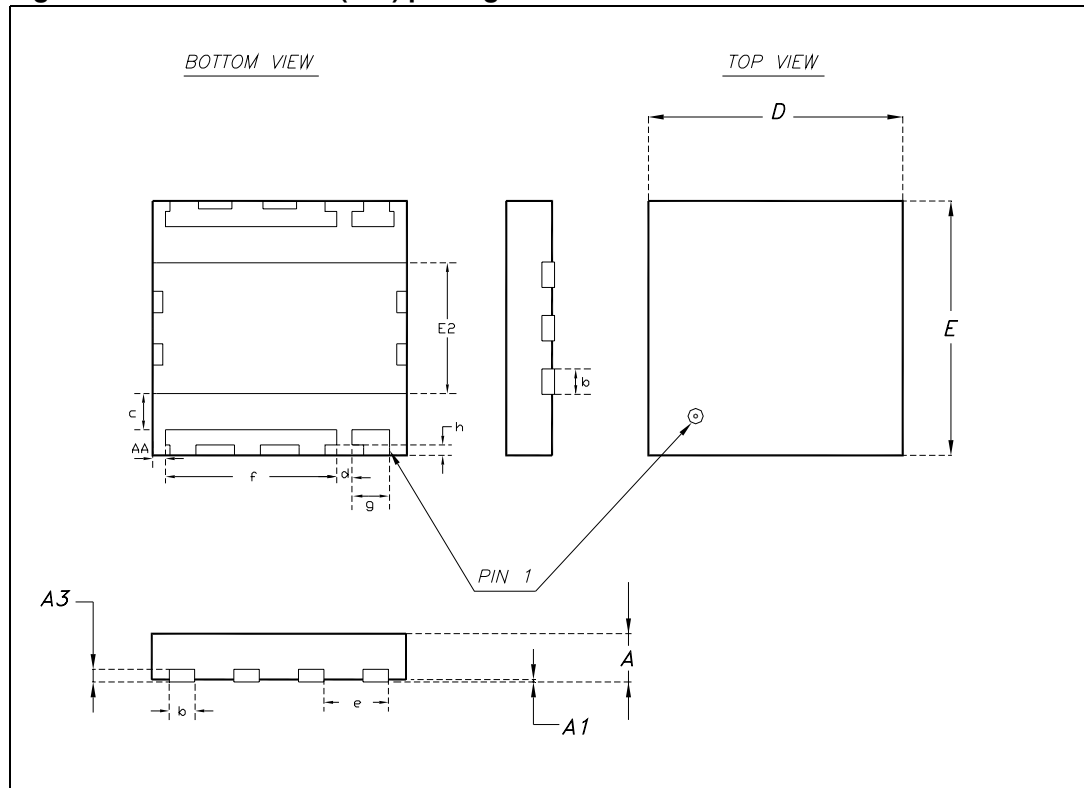


Table 11. Tape and reel dimensions

Dim.	Mm		
	Min	Typ	Max
Ao	5.15	5.25	5.35
Bo	5.15	5.25	5.35
Ko	1.0	1.1	1.2

Figure 16. Tape and reel dimensions

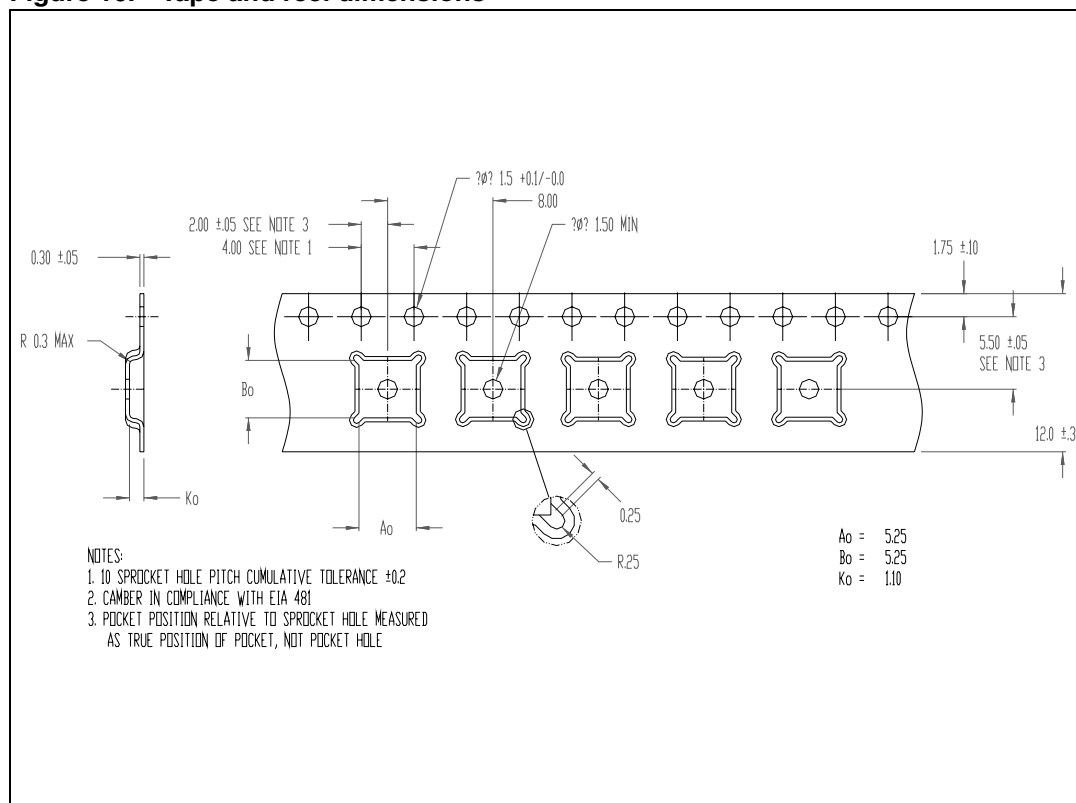
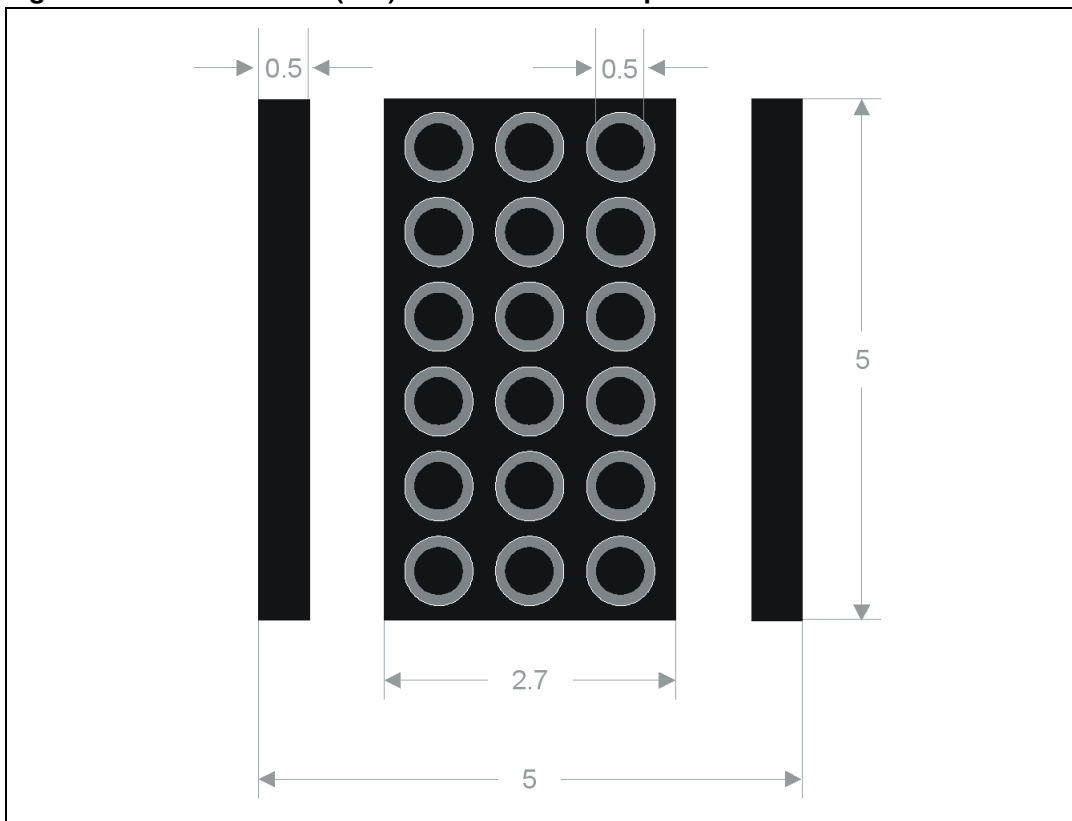


Figure 17. PowerFLAT™ (5x5) recommended footprint



## 9 Revision history

**Table 12. Document revision history**

Date	Revision	Changes
06-Dec-2007	1	Initial release.



**Please Read Carefully:**

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

**UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.**

**UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.**

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2007 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

[www.st.com](http://www.st.com)

